

Report on Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student:	Marek Vařeka
Advisor:	Ladislav Krištofuk
Title of the thesis:	Predicting purchasing intent on ecommerce websites

OVERALL ASSESSMENT (provided in English, Czech, or Slovak):

Please provide your assessment of each of the following four categories, summary and suggested questions for the discussion. The minimum length of the report is 300 words.

Contribution

The thesis analyzes behavior of customers on an e-commerce website with the aim to predict the behavior. More specifically, the thesis aims to predict decision to purchase an item, or model when the customer will leave the website. Author uses standard machine learning classification methods on the Google's Merchandise dataset.

Methods

The main methods used are advanced statistical learning methods for classification compared to baseline logistic regression. More specifically, nonlinear regression with sophisticated optimisation including neural networks and recurrent networks with long short-term memory networks. While all the advanced statistical tools are conveniently implemented nowadays in number of software, author uses standard methodology with this respect.

In the description, I missed emphasis that we are looking at a classification problem, that is we classify if the customer decides purchasing the item or not. Moreover, the main challenge of a similar exercise is to find the best stable solution to the problem, and it is common practice in the machine learning literature to look at various performance metrics. The models being used in the thesis seem to be chosen arbitrarily, especially with respect to the parameters. Working with 331 features, it is important to study regularization of the features, dropout technique regularizing weights in the layers, different number of layers, i.e. how deep the network is as well as how wide the network structures should be, learning rates of the optimisation algorithm, we also know robust state of the art ADAM optimization that should be discussed, we know that an ensemble of networks usually outperforms a single arbitrarily chosen setting, random initialization of weights should be studied too. This whole procedure is commonly referred to as hyperparameter optimisation. I would like the author to comment on the reason why the precise setting has been chosen in contrast to commonly used hyperparameter search, why ensemble networks has not been considered and how stable and robust the results are.

I also miss bit more rigorous statistical comparison of the models. The whole analysis is being compared merely using ROC area, which is an important aspect, but much deeper analysis is needed in order to trust the results. Hence a rigorous statistical comparison, significance of differences between the models etc are missing.

Literature

In the literature review, author discusses Artificial Intelligence, Artificial Neural Networks and machine learning approaches, although a big picture and motivation towards a classification problem is missing. For a general interest reader not familiar with machine learning techniques, this aspect is important. I understand the literature is very wide, and problematics is complex, but author should be able to discuss it and mainly bring and motivate for the general interest reader.

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Manuscript form

Manuscript has solid form, the only aspect that would urgently need to be improved is language that is often vague and makes the thesis hard to read at several places. An example of inappropriate language is introduction that is open with the statement that evolution of hardware and software led to the rise of internet over the past two decades. The reader can only guess that the author mean „commercial internet“, or “services” that he intends to study. Also, author repeats „customer is going to buy something“, or „buy something and what do they want“. Too many times the reader is left to her own imagination, and too many times the language is inappropriate for an academic work.

Summary and suggested questions for the discussion during the defense

In summary, the thesis is a solid exercise applying standard machine learning tools on a data about customers behavior on the internet webpages. This indeed is of economic interest for the internet companies and is a timely topic. Yet, I would welcome more economic discussions, especially deeper thinking and hypotheses. With respect to the analysis itself, I would also welcome deeper statistical analysis that would bring more convincing results. Please see the methodology section for the detailed discussion, as well as questions for the discussion during the defence. In case author will be confident in the discussion, I suggest a final grade C.

SUMMARY OF POINTS AWARDED (for details, see below):

CATEGORY	POINTS
<i>Contribution</i> (max. 30 points)	25
<i>Methods</i> (max. 30 points)	20
<i>Literature</i> (max. 20 points)	15
<i>Manuscript Form</i> (max. 20 points)	12
TOTAL POINTS (max. 100 points)	72
GRADE (A – B – C – D – E – F)	C

NAME OF THE REFEREE: Jozef Barunik

DATE OF EVALUATION: May 22, 2012

Referee Signature

EXPLANATION OF CATEGORIES AND SCALE:

CONTRIBUTION: *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

METHODS: *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

LITERATURE REVIEW: *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

MANUSCRIPT FORM: *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

Overall grading:

TOTAL	GRADE
91 – 100	A
81 - 90	B
71 - 80	C
61 – 70	D
51 – 60	E
0 – 50	F